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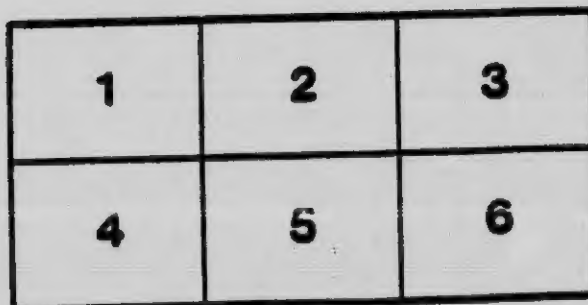
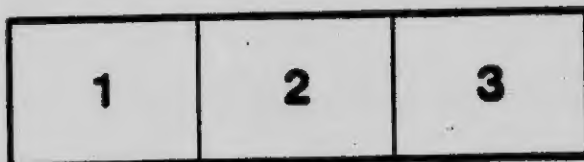
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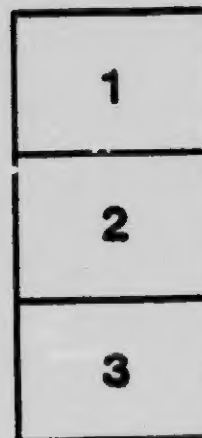
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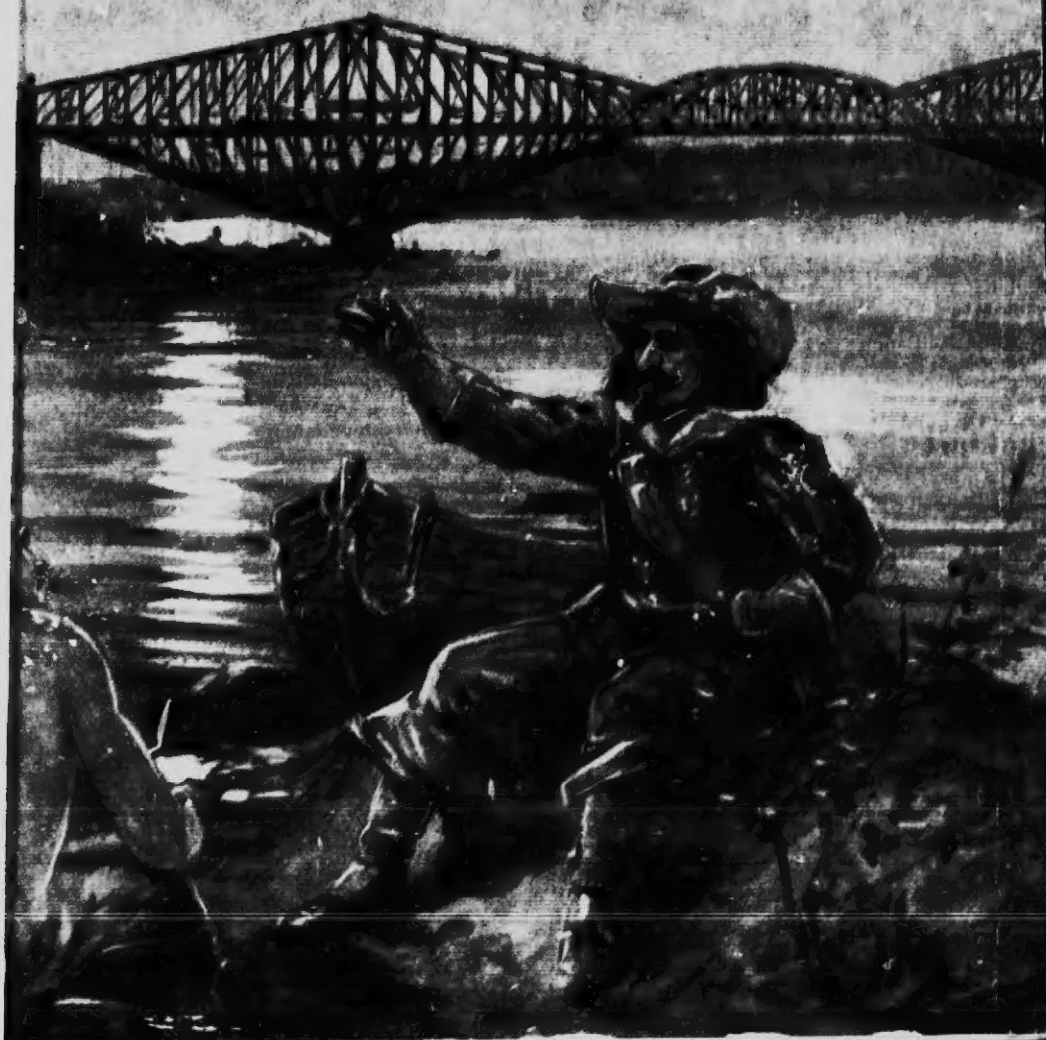


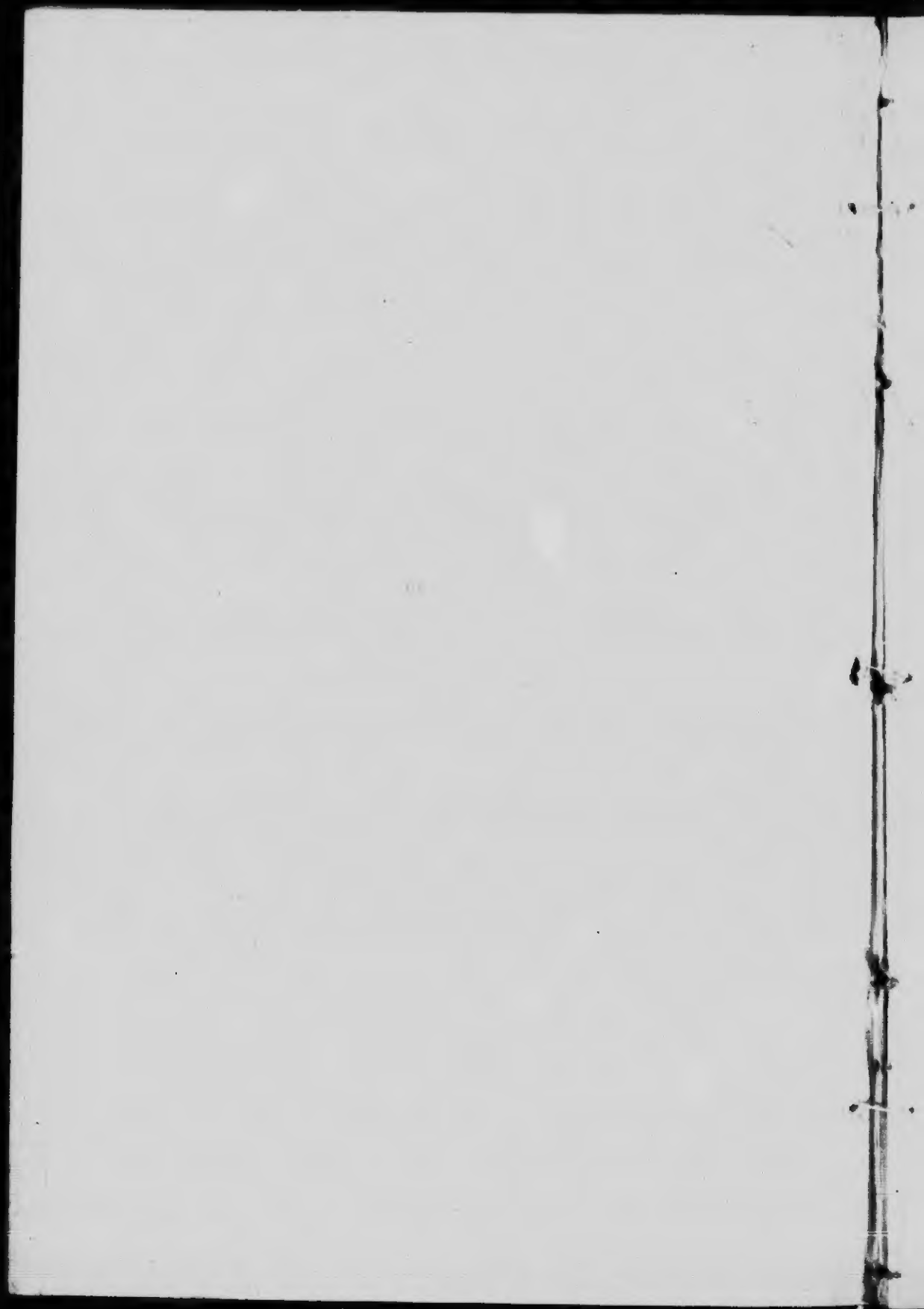
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# The QUEBEC BRIDGE

JOSEPH POPE









# THE QUEBEC BRIDGE

AN ENGINEERING TRIUMPH  
IN THE WORLD'S HISTORY

○

THE CONNECTING LINK  
BETWEEN THE CANADIAN  
GOVERNMENT RAILWAYS  
NORTH AND SOUTH OF  
THE ST. LAWRENCE—ITS  
HISTORY AND FUTURE.

1909

## TOWING THE CENTRE SPAN INTO POSITION



## RAISING THE CENTRE SPAN



"IN the annals of engineering triumphs of the world, the construction of the Quebec Bridge, for immensity, uniqueness of design, excellence of detail and boldness of organization has rarely been equalled and never excelled."

These words are well worth weighing. They convey tersely and without undue emphasis a fitting tribute to a remarkable achievement. For, after years of propaganda and patience, unlimited faith in its ultimate success, and perseverance against disappointments and misfortunes amounting to national calamities, it stands there, this great bridge, completed at last as our greatest monument to the vision, the sagacity and constructive skill of Canada.

### *A Brief History*

The idea of a railway bridge across the St. Lawrence at Quebec originated as far back as 1853, at which date there was no other bridge across the river at any point. A New York engineer, named Serrell, made surveys and prepared plans for a railway bridge on the suspension principle, to be located somewhere near the site of the present bridge. The estimated cost was \$3,000,000. Whether the cost was considered too great an obstacle, or whether it was a lack of courage on the part of engineers, nothing further was done, and the first bridge erected across the St. Lawrence was built at Montreal. This was the Victoria tubular bridge, opened for traffic in 1860, and built by

Robert Stephenson on the model of one he had previously erected over the Menai Straits, on the line to Holyhead, Wales. The project for building a bridge at Quebec to connect that city with the south shore of the St. Lawrence lay dormant until 1882, when M. W. Baby obtained a charter to erect a bridge. He had associated with him A. L. Light, a well known engineer, who interested some of the engineers of the then newly completed Forth Bridge in the undertaking. The idea then advanced was to erect a bridge on the cantilever plan, which the erection of the Forth Bridge had demonstrated to be the last word in big bridge designing. This second proposal also failed to get beyond the project stage.

The third attempt was made in 1887, when the Dominion Parliament incorporated the Quebec Bridge Co., with an authorized capital of \$1,000,000. The company's powers were extended in 1891, and in 1897 they were revived and confirmed, new interests led by S. N. Parent, then Mayor of Quebec, and afterwards Premier of the Province, having obtained control of the company. U. Barthe became secretary of the company, and United States capitalists were interested. A New York engineer undertook the designing of the bridge, and E. A. Hoare was chief engineer in charge of all local work. The same site on which the present bridge is built was selected, work was started on the sub-structure in August, 1900, and was completed at the end of 1902. From that time forward the erection of the steel work went on apace, and was

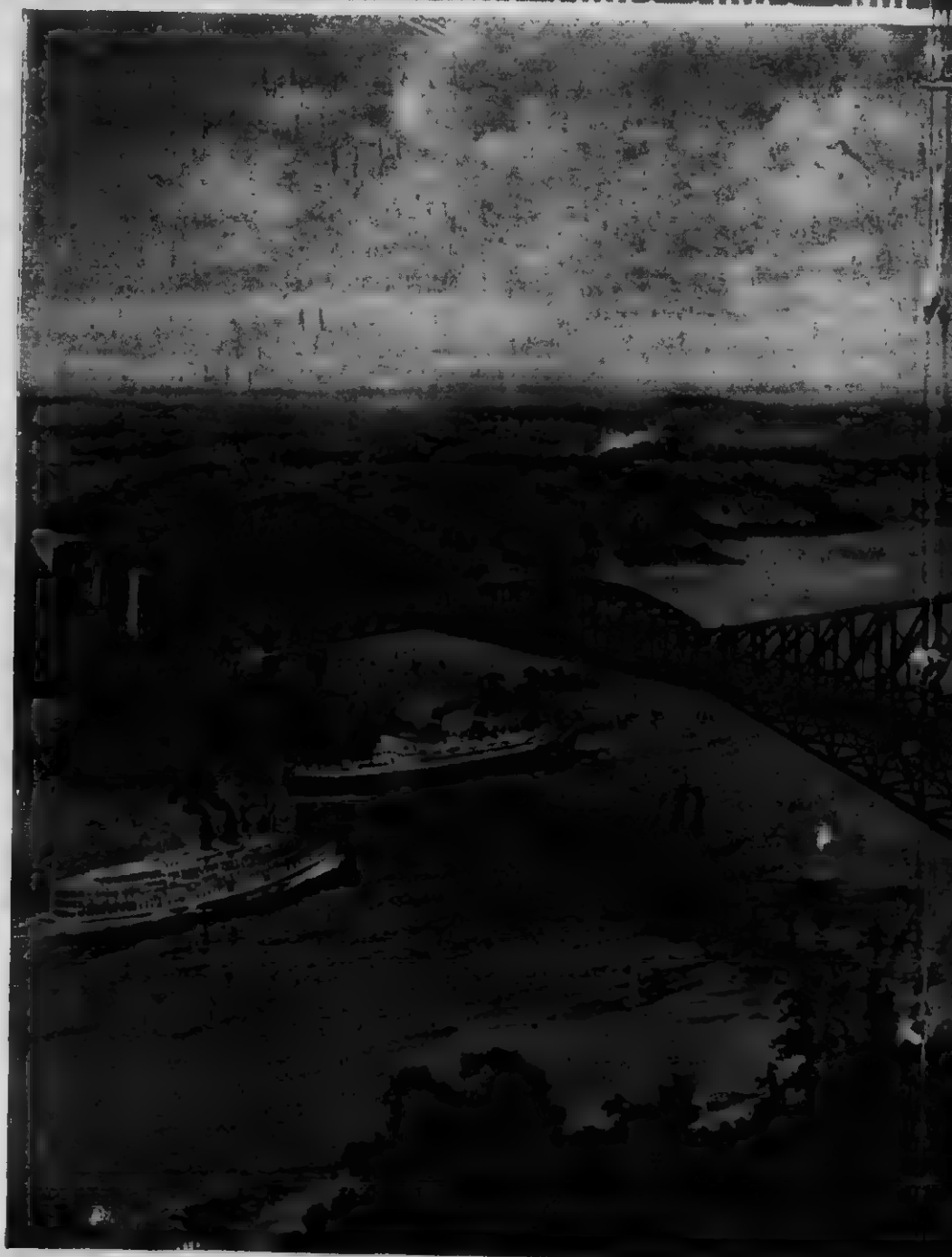
carried on without interruption until August 29, 1907, when the south cantilever arm collapsed.

The Dominion Government then appointed a Commission to investigate the cause of the catastrophe, with the result that the Government undertook to complete the bridge as a Dominion Government work, and in 1908 appointed a board of three engineers to prepare plans.

The Board made very exhaustive studies of various possible designs, both suspension and cantilever. Tenders were called on cantilever designs with invitation to submit alternative tenders on the bidders' own designs. One German, one English, and one American firm bid on the Board's designs, but the St. Lawrence Bridge Company bid only on their own alternative K-truss designs, and received the contract.

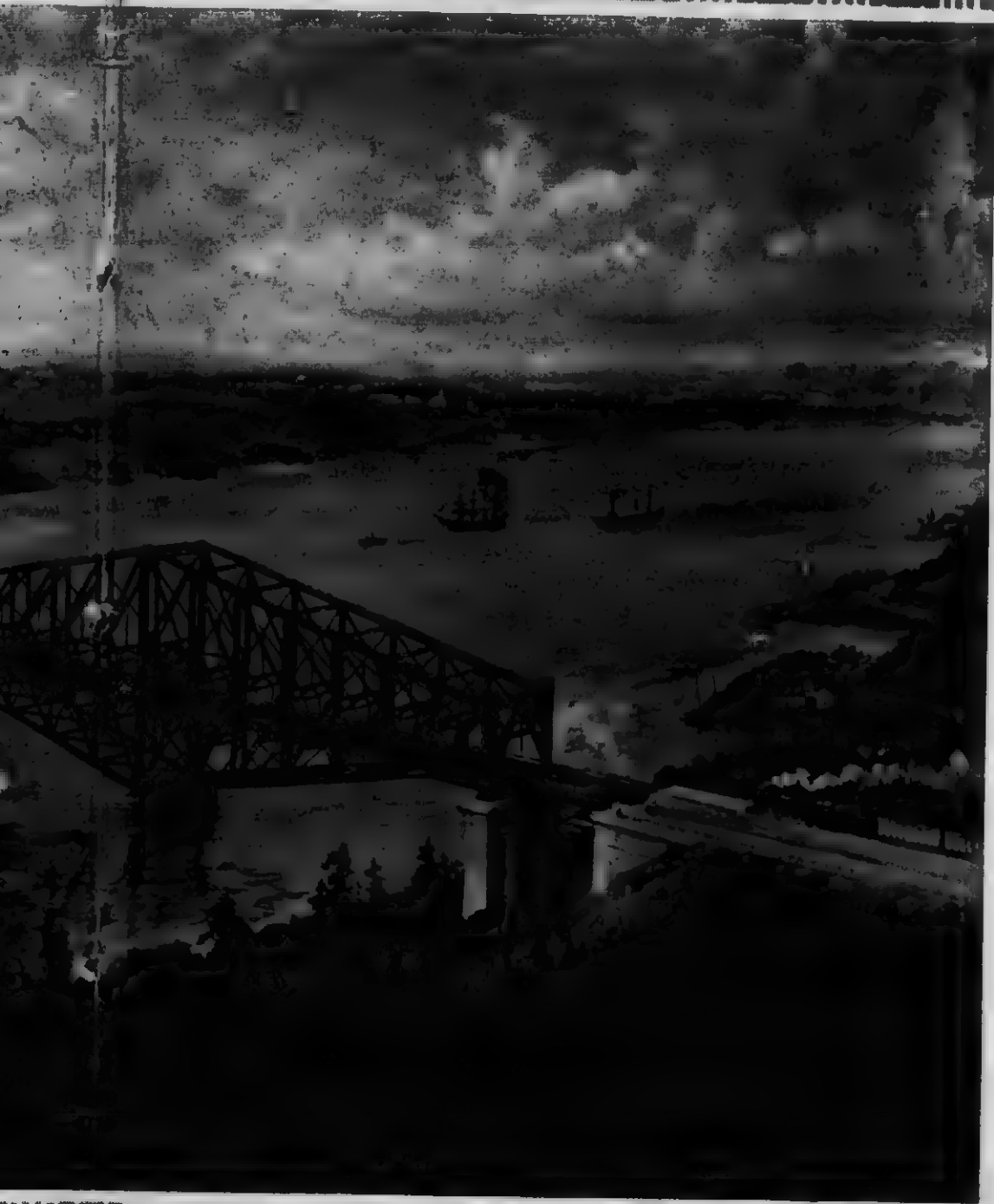
The Government had invited both the Dominion and Canadian bridge companies to tender on the new Quebec bridge, but it was thought that if the Canadian bridge companies were to present a solid front in the bidding—in other words, to pool their organizations, experience and facilities—that Canada would have a better chance of being successful in the bidding, and the Canadian Bridge Company therefore joined with the Dominion Bridge Company as joint owners of the capital stock of the St. Lawrence Bridge Company, and the only bids made by any Canadian firm were submitted in the name of the St. Lawrence Bridge Company.

# THE QUEBEC BRIDGE -



*In the annals of engineering the construction of the Quebec Bridge, for its detail, boldness of organization, has rarely*

**E** - *The Connecting Link Between the Lines of the Canadian  
Government Railways North and South of the St. Lawrence*



*Quebec Bridge for immensity, uniqueness of design, excellence of  
has rarely been equalled and never excelled.*

### *Daring and Ingenious Methods of Erection*

Work was started promptly by the contractors, both for the substructure and for the superstructure, and everything went on so successfully that the St. Lawrence Bridge Company expected to complete its work at the end of 1916—earlier than was estimated. September 11th, 1916, was set for floating out the suspended member of the central span. The centre span was erected at Sillery about three miles below the bridge site. After it had been completely assembled and riveted up, the span was placed on specially constructed scows and thence guided by tugs, was floated into position under the cantilever arms of the bridge. Many simple spans have been lifted into place where they could be handled from barges with ordinary derrick cars, but the Quebec Bridge span was by long odds the largest span of any kind that had been constructed. It was the first attempt that was ever made at hoisting a span of such an immense weight and size by hydraulic hoists.

The first part of this work had been successfully completed, and the 640 ft. long span had been raised several feet when, owing, as was afterwards ascertained, to the failure of a portion of one of the castings in the hoisting apparatus, the span slipped, crumpled up and fell to the bottom of the river. The fullest investigation was made in the matter, and it was found that there was no defect in the span, or in the plan, and that the other sections of the bridge had received no damage from the acci-

dent. The company immediately put in hand the fabrication of the steel for a new span and began to prepare for its being placed into position. This was done, and the new span was ready for erection at the time of the September high tides, 1917. The method of erection was not changed except that extra precautions were taken in connection with the manufacture and getting in place of the hoisting apparatus. The span weighed about 5,000 tons and this weight had to be raised so that there would be a clearance of 150 ft. at high water. The hoisting proceeded steadily and the lift was completed September 20, after which the bolting of the span into place was taken in hand.

### *The Quebec Bridge, most Wonderful Engineering Feat of the Century*

As has already been mentioned, this bridge possesses the longest span in the world, its total length being 1,800 ft. or 90 feet greater than that of the famous Forth Bridge. The following figures give a vivid idea of its record size and proportions:

Total length of bridge.....	3,240 ft.
Length of main span.....	1,800 ft.
Length of suspended span.....	640 ft.
Length of cantilever arms.....	1,160 ft.
Length of anchor arms.....	1,030 ft.
Depth of trusses at main pier.	310 ft.
Depth of trusses at end of cantilever and anchor arms	70 ft.

Depth of suspended span at centre.....	110 ft.
Width of bridge centre to centre of trusses.....	88 ft.
Clear height of steel work above high water.....	150 ft.
Weight of steel in bridge.....	66,000 tons
Quantity of masonry.....	106,000 cu. yds.
Depth of main piers below high water.....	101 ft.
Height of anchor piers above high water.....	136 ft.

### *Names written large in Engineering History*

Prominently and permanently connected with the success of this gigantic enterprise—the stress of the times through which we are passing has prevented it from being viewed in proper perspective—and names which will be written large in Engineering History are:—

#### *Government Engineering Commission:*

Lt.-Col. C. N. Monsarrat, *Chairman and Chief Engineer.*

Ralph Modjeski,                      H. P. Borden.

#### *Contractors for the superstructure:*

St. Lawrence Bridge Company, Limited,

Mr. Phelps Johnson, President,

Mr. Geo. H. Duggan, Chief Engineer,

Mr. Geo. F. Porter, Engineer of Construction.

#### *Contractors for the substructure:*

M. P. & J. T. Davis.



### *Some Comprehensive Comparisons*

The length of the centre span is greater than the distance between St. Catherine and Craig Streets, Montreal. The length of suspended span exceeds the distance between St. Catherine and Dorchester Streets, Montreal, and would almost cover the Champ de Mars. The width of the bridge is 28 feet greater than the width of Bleury Street, Montreal. The height of the base of rail above low water is greater by 15 feet than the height of Horse-shoe Fall at Niagara. The distance from the low water level to the top of the main posts is equal to the combined height of the Eastern Township Building and the towers of the Notre Dame Church, Montreal. The Bridge is wide enough between the trusses to accommodate two railway tracks, a driveway for vehicular traffic and two concrete foot paths for pedestrians. The quantity of stone used in the main and anchor piers is greater than that used in the foundations of all the buildings in the city of Quebec. The south anchor pier is higher than the Canada Life Building, Montreal. Nearly 3,000,000 rivets were used in the superstructure. It is estimated the bridge, when completed, will cost \$15,000,000.

### *The Quebec Bridge—Its future Utility*

The Quebec Bridge connects the Canadian Government lines on the South of the St. Lawrence with the Government lines on the North and is the link which shortens the distance between

Halifax and Winnipeg by two hundred miles. It is the connecting link also between the two vast transcontinental systems and the railways reaching the Atlantic seaboard.

Ten important railways are seeking interchange of traffic at Quebec. The Bridge will be the means to that end. On the South side of the river are the two Government Railways, The Grand Trunk, The Quebec Central and the Delaware & Hudson Railways. On the North side are the Government Railways, the Canadian Pacific, the Canadian Northern, the Quebec & Lake St. John, and the Quebec & Saguenay Railways.

It gives the shortest connection between the immense pulp mills and pulp forests of Northern Quebec and the markets in the Eastern States.

So intense has become the traffic over the Victoria and Laurier bridges at Montreal, that in recent years both have had to be re-built and double tracked.

Already approaching a thousand cars a week are crossing the bridge, and passenger trains via the Canadian Government Railways are using it between Quebec and Montreal. What, then, when the world turns from war to peace? With the development of Canada and the vast expansion of Canadian trade, which is confidently expected, no very optimistic vision is necessary to foresee the important part the Quebec Bridge will perform in the immense increase of traffic which must necessarily result.

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